

Report Number: 15090289VR Access Solutions Limited
8 Vine Lane
Acocks Green
Birmingham
B27 6SYOrder Number : Mr Derick Case
Date of Issue: 13/10/2015
Test Date : 18/09/2015
to 09/10/2015

This report details the results of tests carried out on D/F Double used for connecting steel tubes of 48.3mm outside diameter and of at least 3.2mm nominal wall thickness at a minimum in the construction of working scaffolds and falsework required for the construction, maintenance, repair and demolition of buildings and structures.

Description and Marks on couplings

D/F Double

Marks : EN74-B-L VRS 0615

Basis of Tests

The couplings have been tested in accordance with the relevant sections and requirements of EN 74-1 :2005.

Information supplied by the customer

Manufactured by: VR Access Solutions Limited
Shape: As per drawings shown at the end of this report
Dimensions: As per drawings shown at the end of this report
Mass: As per drawings shown at the end of this report
Material Characteristics: As per drawings shown at the end of this report

RESULTS**Design**

The design of the coupling complied with the requirements of the relevant items in clause 6.2 of the standard.

Dimensions and Material Characteristics

The measured dimensions, mass and material characteristics, of the couplings, were all within the tolerances as specified by the manufacturer. (Drawings are shown at the end of this report)

Marking

The markings satisfy the requirements laid out in EN74-1.

Results of all tests performed are detailed on the following pages.

All requirements stated are minimum values.

This report consists of the report, appendix A, appendix, B and Appendix CAuthorised Signatory
L Mangham
Operations Manager

Where appropriate, the results reported herein provide traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. Any opinions or interpretations given herein fall outside the scope of our schedule of accredited testing. If, upon reproduction, only part of this report is copied, Element will not bear any responsibility for content, purport and conclusions of that reproduction. Original reports issued by Element, either in electronic or physical form have legal value only when furnished with an authorised signature. Any subsequent digital or physical copies of this report have no legal value unless authorised by Element. The Terms & Conditions of Element, available upon request, are applicable on all services provided by Element. NB: Results given in this report relate only to the items received and tested.

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Slipping Force Tests, tested in accordance with Clause 7.2.1

Tested using 3.2mm steel tube (RT_{S1})		
Test Number	$\Delta_1 \leq 7\text{mm}$ (kN)	$1 \leq \Delta_2 \leq 2\text{mm}$ (kN)
1	22.71	24.24
2	18.09	27.8
3	19.28	28.77
4	20.6	25.59
5	20.18	25.55
6	20.94	27.54
7	19.57	22.72
8	21.6	21.57
9	29.48	30
10	21.43	28.52

$F_{S5\%}$	16.06	20.79
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Tested using 4.0mm aluminium tube (RT_A)		
Test Number	$\Delta_1 \leq 7\text{mm}$	$1 \leq \Delta_2 \leq 2\text{mm}$
11	22.89	30
12	23.63	30
13	22.22	30
14	23.55	30
15	23.4	30

$F_{S5\%}$	21.72	30.00
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Photograph of Setup for Slipping Force



The photograph above shows the setup for slipping force but is not necessarily the coupler under test.

The $F_{S5\%}$ figures must be equal to or greater than the requirements stated below.

Requirements from EN 74-1 table 8:

Class B:	$\Delta_1 \leq 7\text{mm} = 10\text{kN}$ Minimum $1 \leq \Delta_2 \leq 2\text{mm} = 15\text{kN}$ Minimum
Class A:	$\Delta_1 \leq 7\text{mm} = 7\text{kN}$ Minimum $1 \leq \Delta_2 \leq 2\text{mm} = 10\text{kN}$ Minimum

From the results, the prototype is Accepted to Class B for slipping force

Load-displacement curves are shown in Appendix A as charts 1 to 15



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Failure Force, tested in accordance with clause 7.2.2

Tested using solid steel bar (RB)	
Test Number	Maximum Load $P_{f,ult}$ (kN)
16	48.54
17	45.54
18	59.06
19	54.04
20	59.08

$F_{f,5\%}$	31.79
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The $F_{f,5\%}$ figures must be equal to or greater than the requirements stated below.

Requirements from EN 74-1 table 8:-

$P_{f,ult}$ = 30.0kN minimum for Right Angle couplers & 20kN for Swivel couplers

Load-displacement curves are shown in Appendix B as charts 16 to 20

From the results, the prototype is Accepted to Class B for failure force

Photograph of setup for Failure Force



The photograph above shows the setup for failure force but is not necessarily the coupler under test.

Pull Apart Force, tested in accordance with clause 7.3

Tested using solid steel bar (RB)	
Test Number	Maximum Load $F_{p,c}$ (kN)
21	60
22	54.32
23	57.64
24	57.22
25	59.18

$F_{p,5\%}$	41.96
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Requirements from EN 74-1 table 8:-

$P_{f,ult}$ = 20.0kN minimum

Load-displacement curves are shown in Appendix B as charts 21 to 25

From the results, the prototype is Accepted to Class B for pull apart force

Photograph of setup for Pull Apart Force



The photograph above shows the setup for pull apart force but is not necessarily the coupler under test.



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Indentation Check, tested in accordance with clause 7.5

Tested using 2.7mm wall steel tube (RT _{S2})	
Test Number	Maximum Indentation Δ_{10} (mm)
26	0.84
27	0.79
28	0.86
29	0.9
30	0.77

The figures must be equal to or greater than the requirements stated below.

Requirements from EN 74-1 table 8:-
 $P_{ind} = \leq 1.5\text{mm}$

From the results, the prototype is Accepted to Class B for indentation check

Photograph of setup for Indentation Check



The photograph above shows the setup for indentation check but is not necessarily the coupler under test.

Cruciform Bending Stiffness Tests, tested in accordance with Clause 7.4.1

Tested using 3.2mm steel tube (RT _{S1})			
Test Number	$C_{\phi 1, MB, C}$ (kNm/rad)	$C_{\phi 2, MB, C}$ (kNm/rad)	$M_{ult, c}$ kNm
31	39.69	10.58	2.67
32	46.02	10.60	2.67
33	41.31	8.44	2.67
34	20.20	8.50	2.67
35	44.99	13.77	2.67
36	40.08	9.59	2.67
37	48.66	12.11	2.67
38	33.73	7.72	2.67
39	39.91	10.40	2.67
40	43.96	10.53	2.67
$M_{B, 5\%}$	22.92	6.99	2.67

The $M_{B5\%}$ figures must be equal to or greater than the requirements stated

Requirements from EN 74-1 table 8:

Steel Tube		
$C_{\phi 1, MB, C}$	=	15.0 kNm/rad
$C_{\phi 2, MB, C}$	=	6.0 kNm/rad
$M_{ult, c}$	=	1.6 kNm
Aluminium Tube		
$C_{\phi 1, MB, C}$	=	13.0 kNm/rad
$C_{\phi 2, MB, C}$	=	5.0 kNm/rad
$M_{ult, c}$	=	1.6 kNm

Load-displacement curves are shown in Appendix C as charts 31 to 45

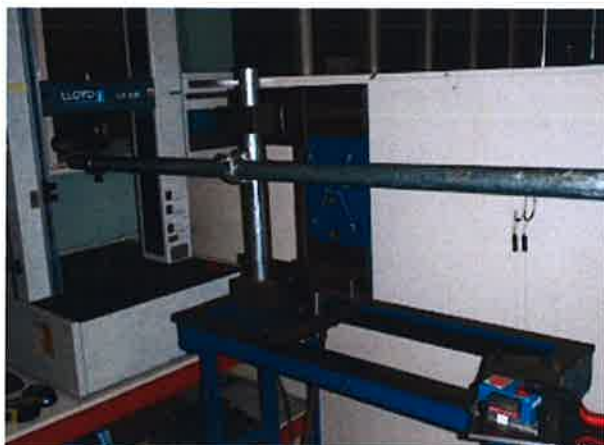
Tested using 4.0mm aluminium tube (RT _A)			
Test Number	$C_{\phi 1, MB, C}$ (kNm/rad)	$C_{\phi 2, MB, C}$ (kNm/rad)	$M_{ult, c}$ kNm
41	32.05	12.98	2.67
42	32.05	12.89	2.67
43	30.53	7.40	2.67
44	25.23	7.57	2.67
45	31.74	9.97	2.67
$M_{B, 5\%}$	23.46	5.03	2.67

From the results, the prototype is Accepted to Class B for cruciform bending stiffness and ultimate moment



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Photograph of setup for Cruciform Bending Stiffness



The photograph above shows the setup for cruciform bending stiffness but is not necessarily the coupler under test.

Rotation Stiffness and Moment Tests, tested in accordance with Clause 7.4.2

Tested using 4.0mm aluminium tube (RT _A)		
Test Number	$C_{\phi,MT,c}$ kNm/rad	$M_{T,c}$ kNm
46	37.36	0.733
47	30.95	0.687
48	57.35	0.860
49	31.15	0.695
50	30.90	0.665

$M_{T5\%}$	18.88	0.56
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Tested using 4.0mm aluminium tube (RT _A)		
Test Number	$C_{\phi,MT,c}$ kNm/rad	$M_{T,c}$ kNm
51	19.88	0.773
52	19.72	0.571
53	22.26	0.640
54	24.25	0.653
55	20.02	0.601

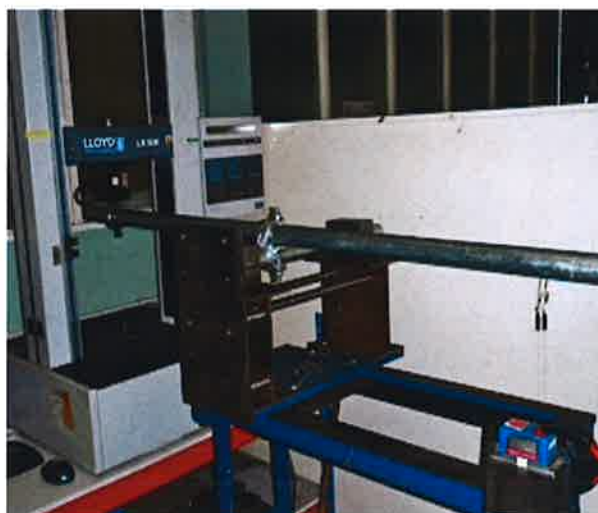
$M_{T5\%}$	16.91	0.49
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The $F_{S5\%}$ figures must be equal to or greater than the requirements stated below.

Requirements from EN 74-1 table 8:

Steel and Aluminium Tube		
$C_{\phi,MT,c}$	=	7.5 kNm/rad
$M_{T,c}$	=	0.13 kNm

Photograph of setup for Rotation Stiffness and Moment



The photograph above shows the setup for rotation stiffness and moment but is not necessarily the coupler under test.

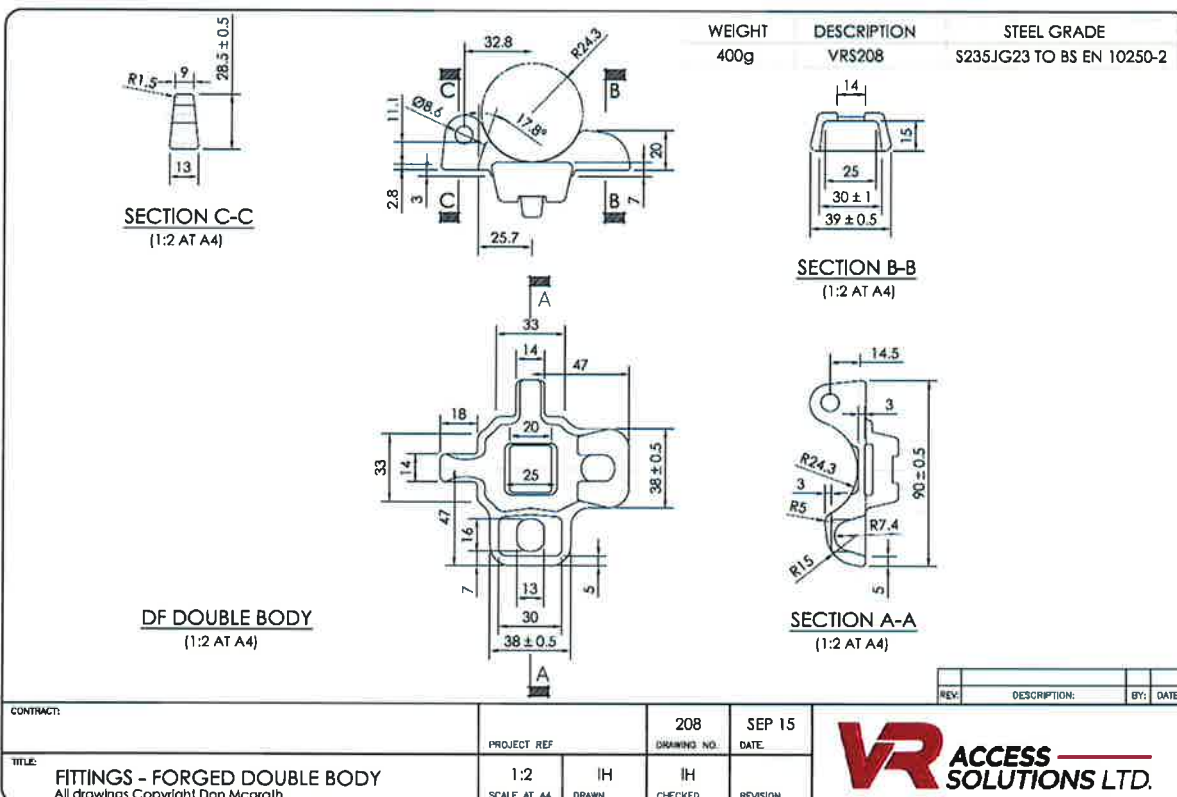
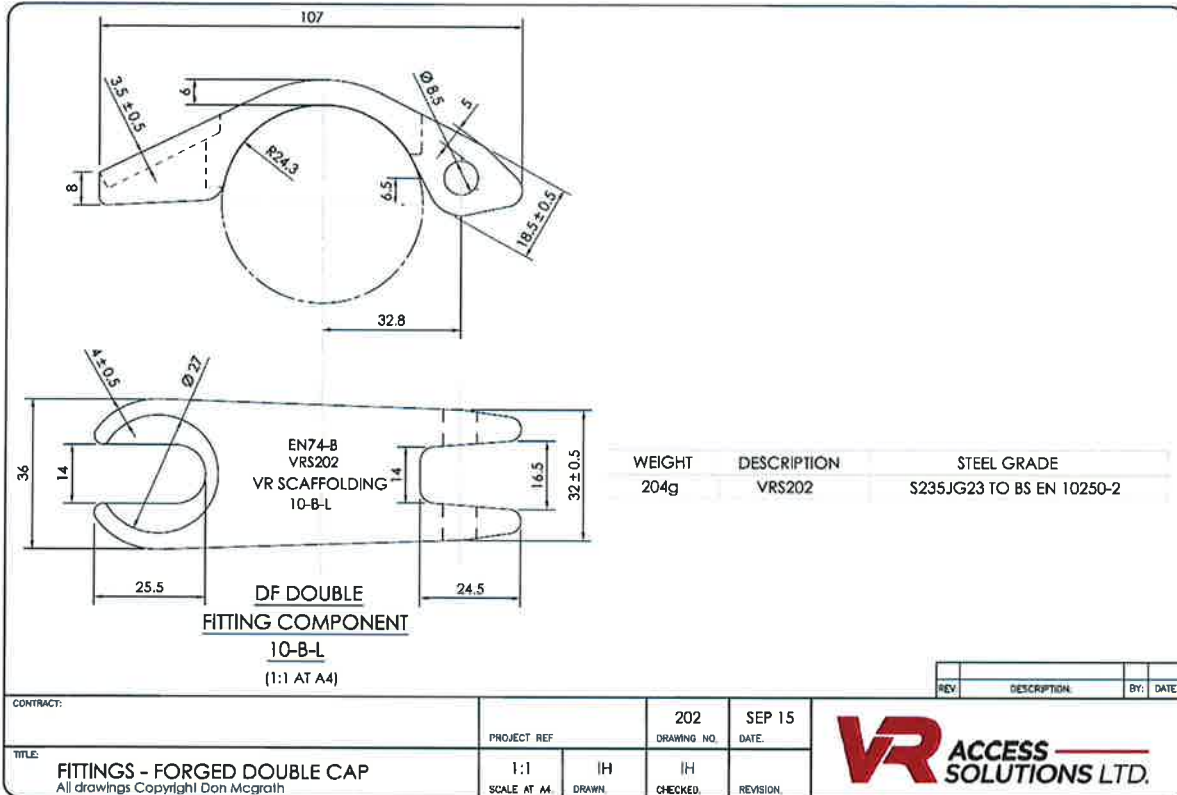
Load-displacement curves are shown in Appendix C as charts 46 to 55

From the results, the prototype is Accepted to Class B for rotation stiffness and moment



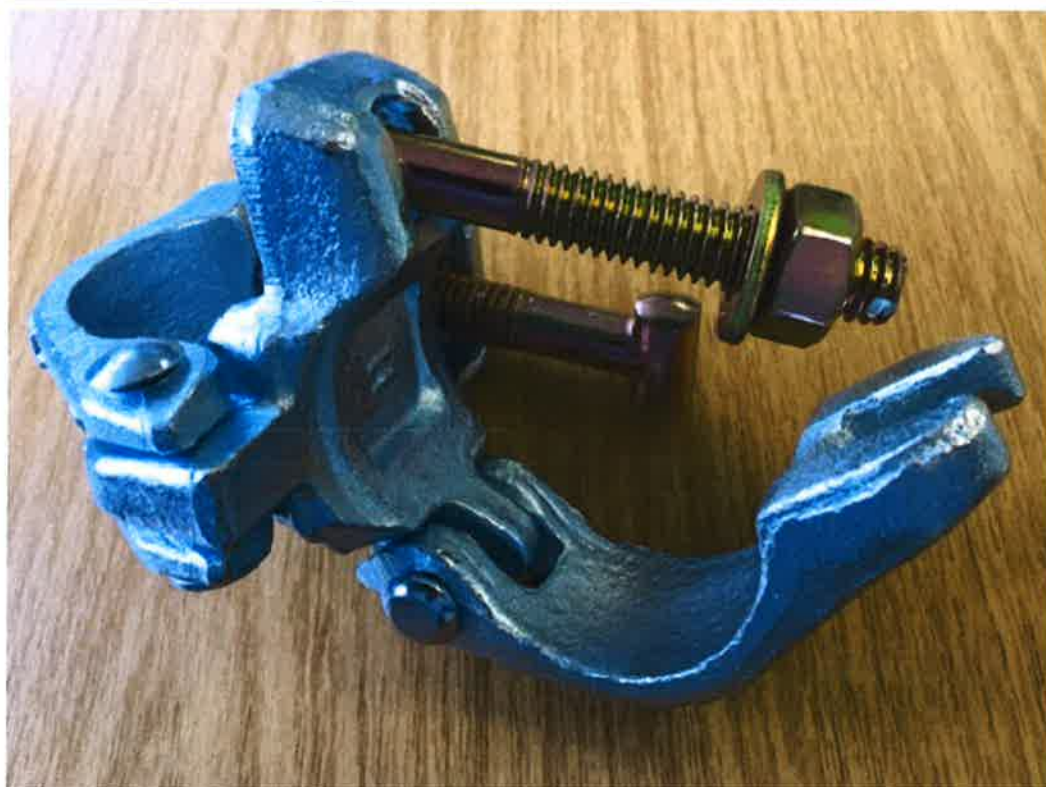
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Drawings



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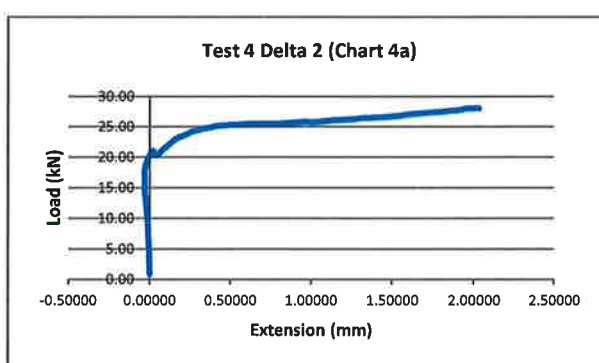
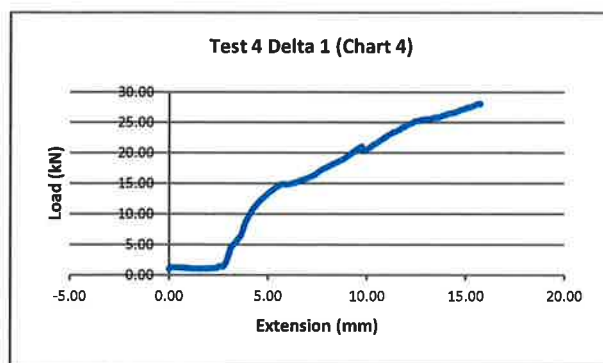
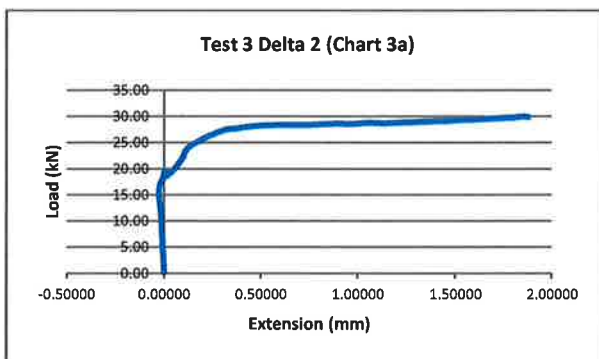
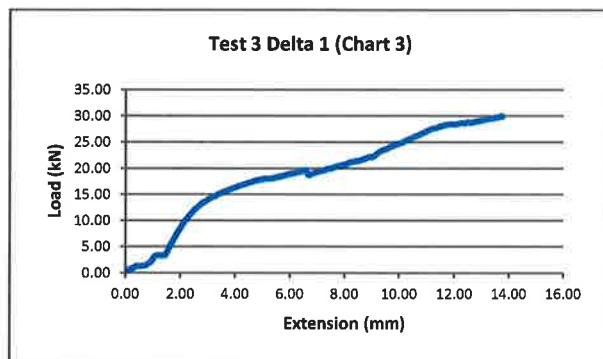
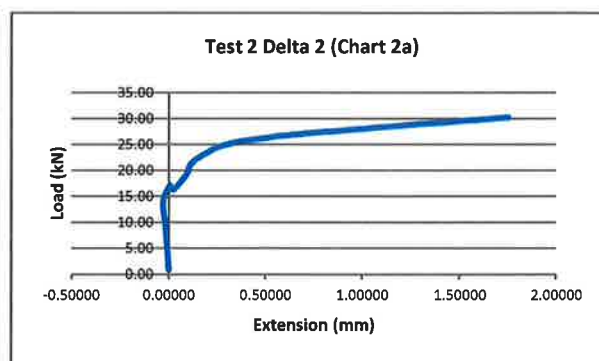
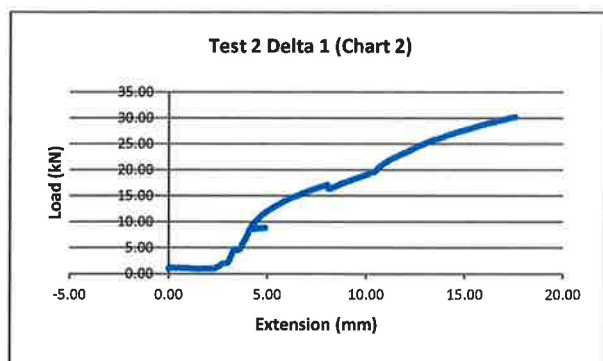
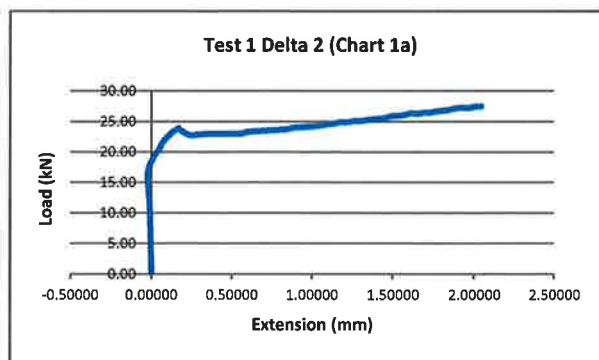
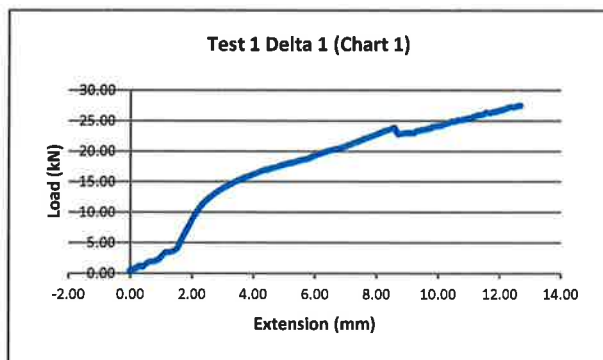
Photograph of coupler under test



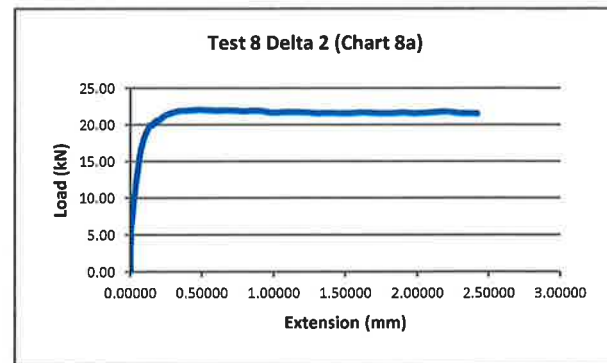
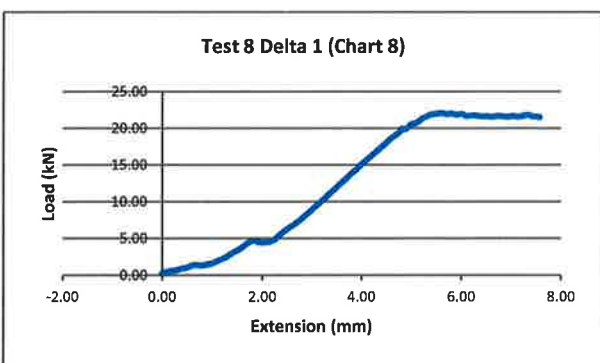
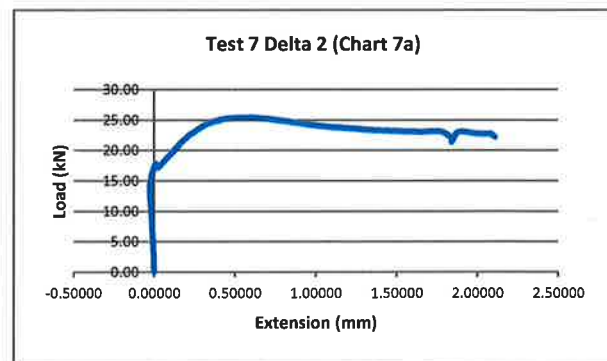
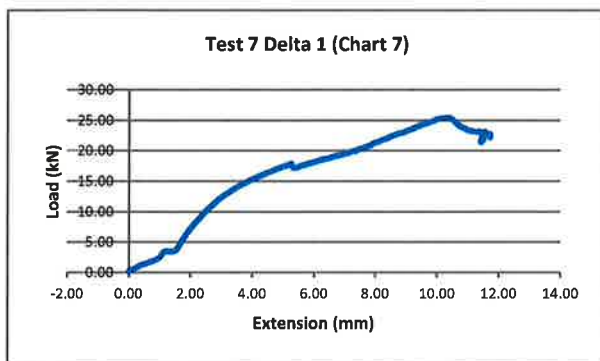
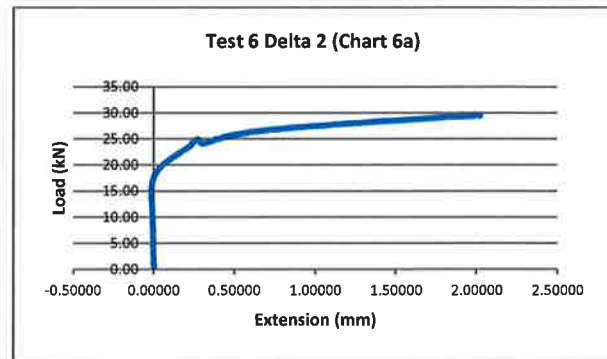
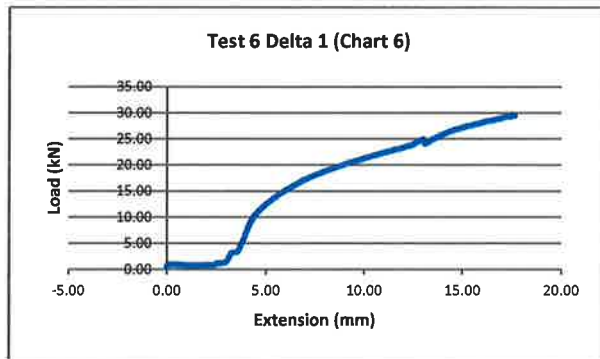
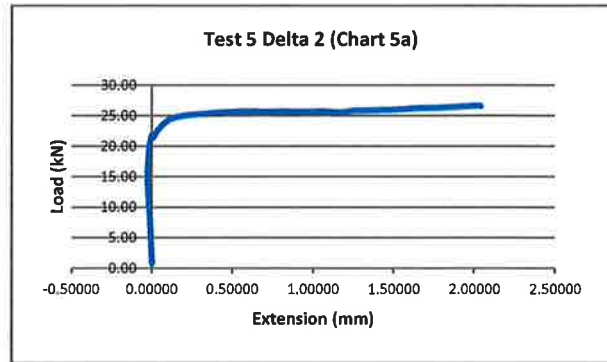
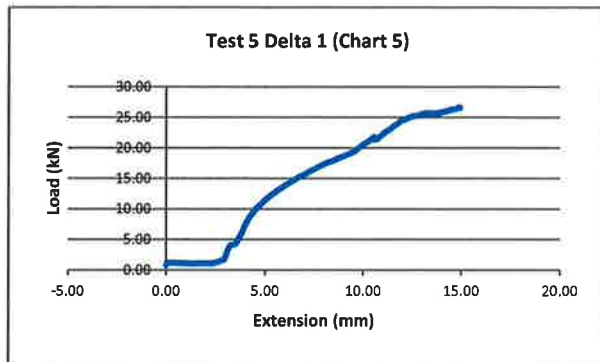
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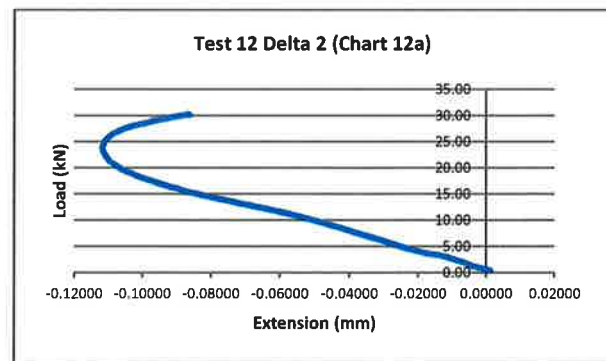
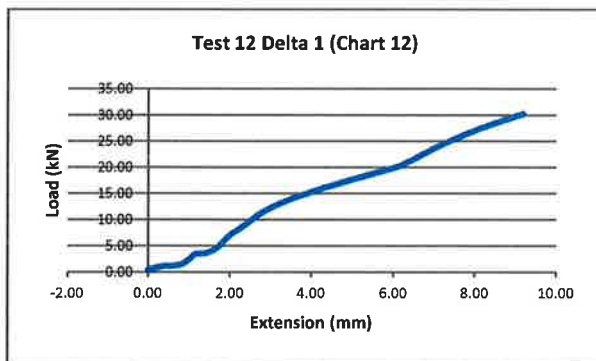
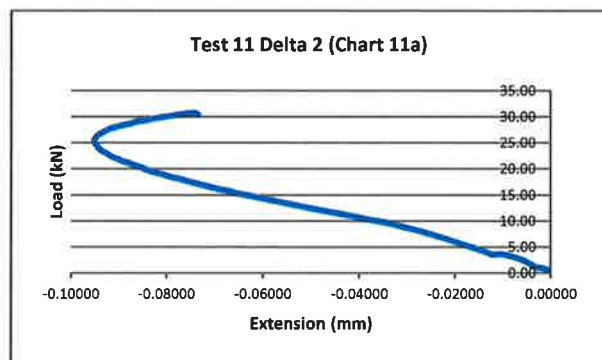
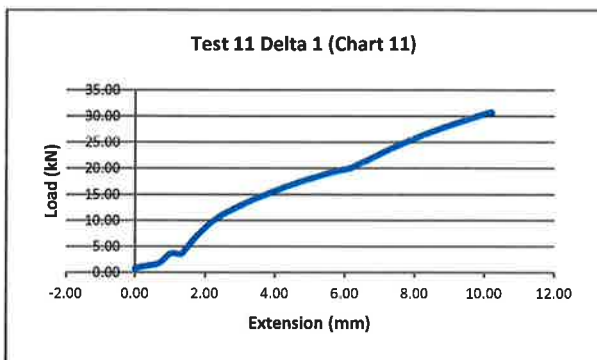
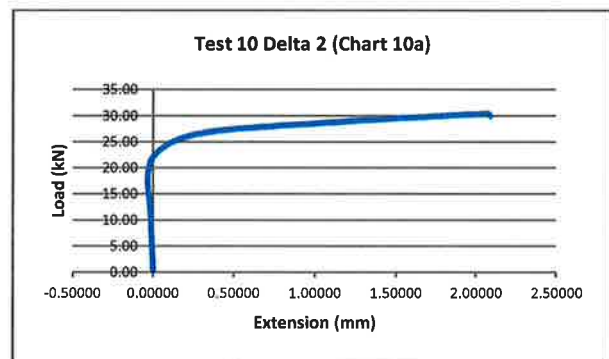
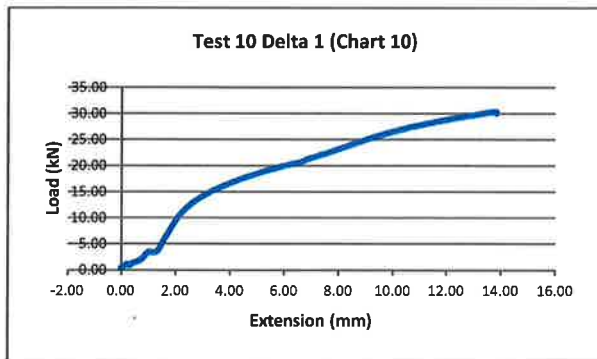
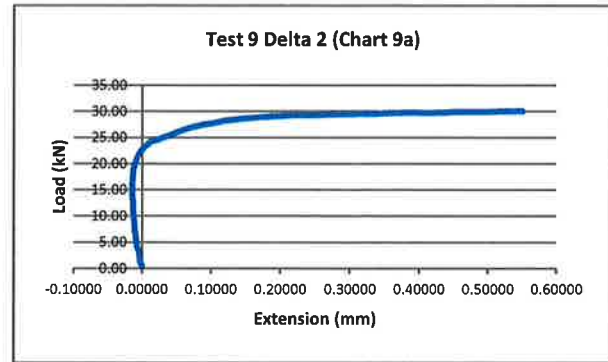
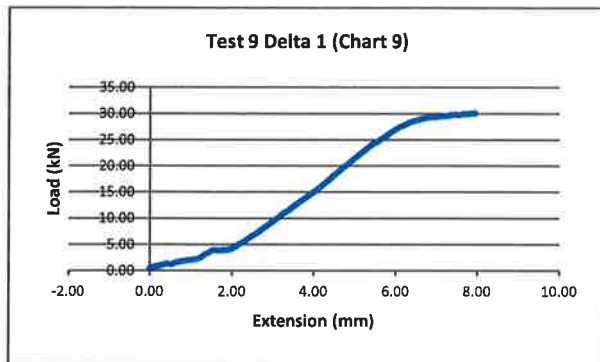
Appendix A




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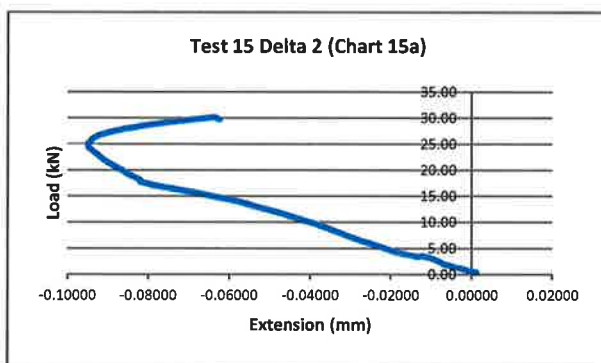
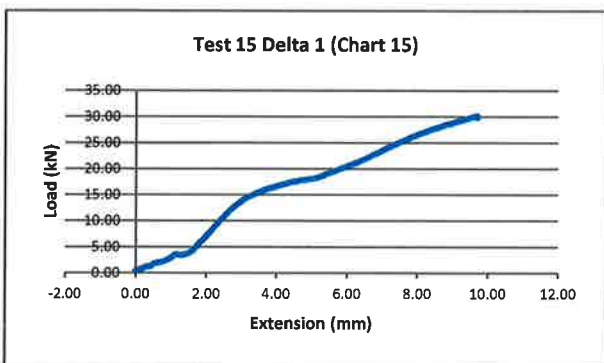
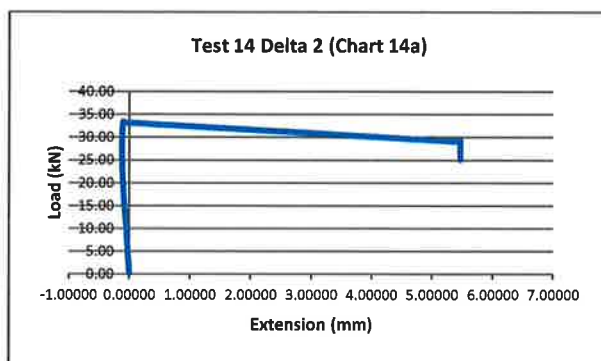
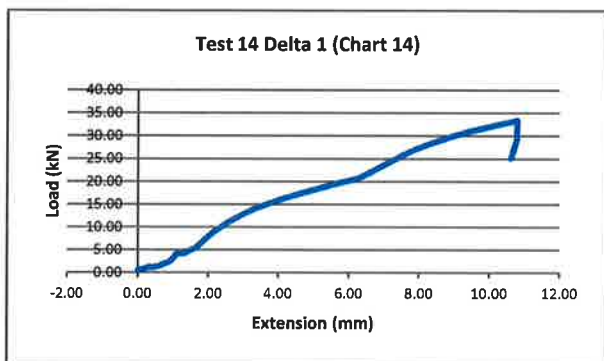
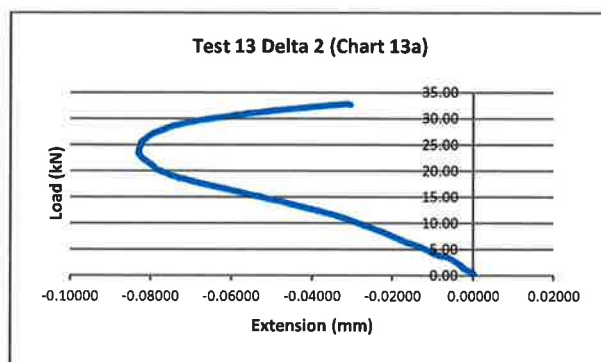
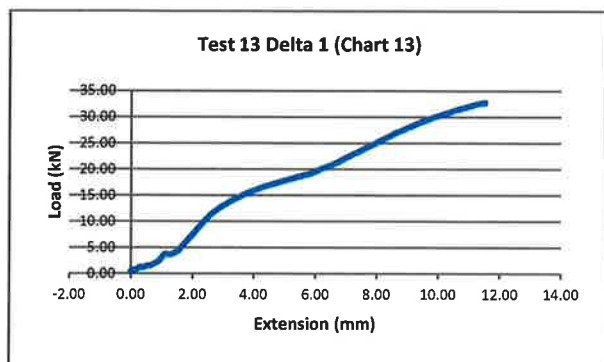


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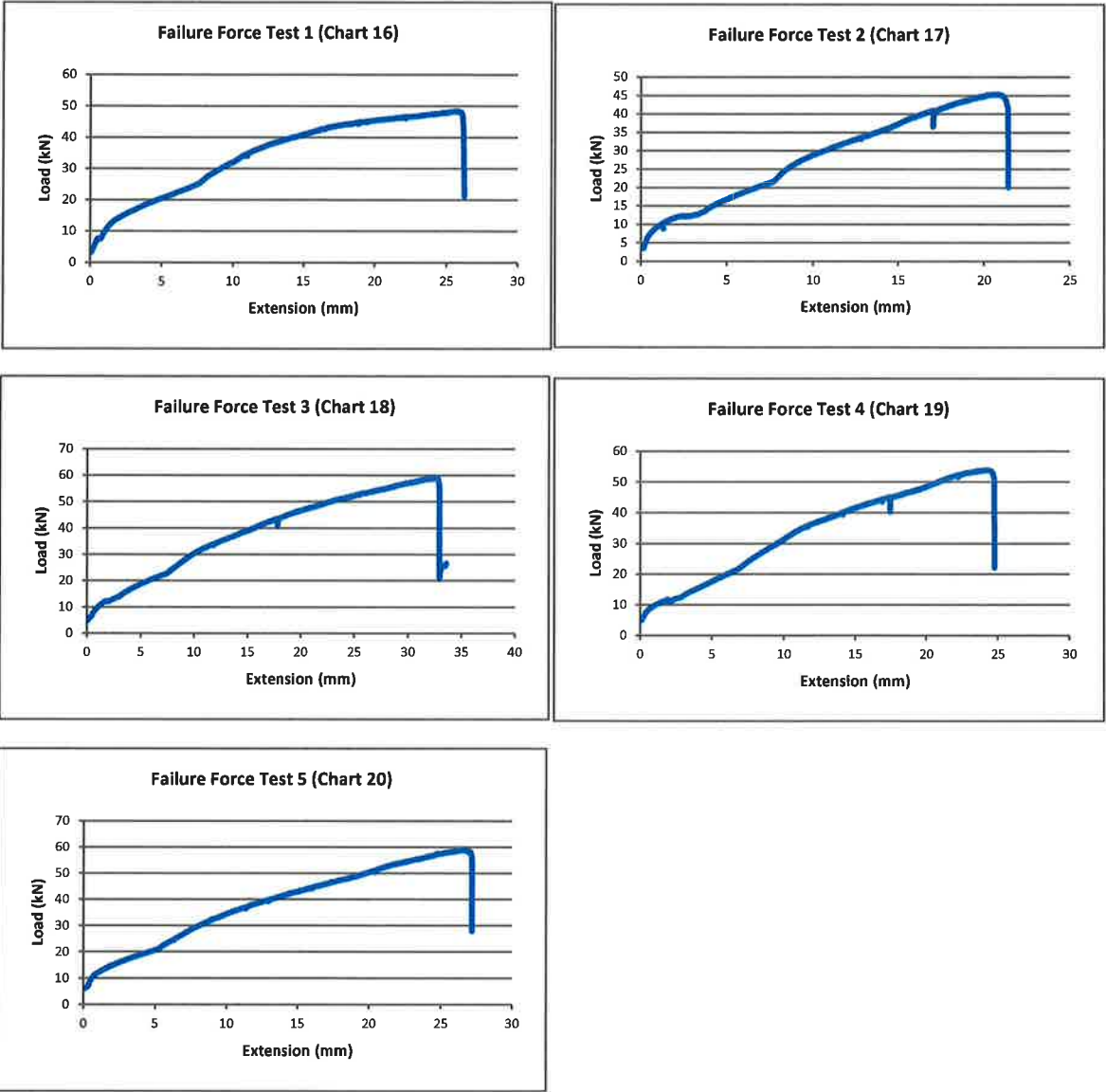
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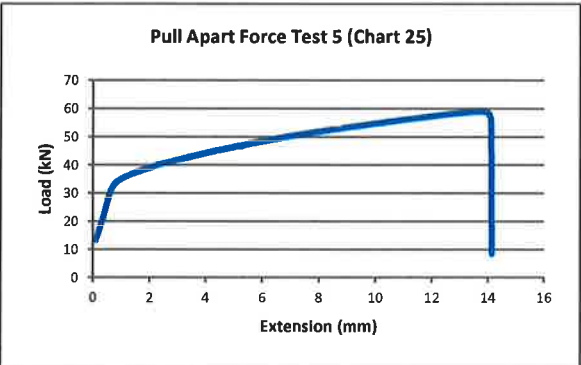
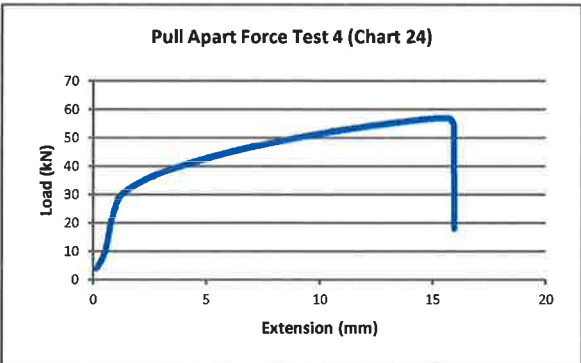
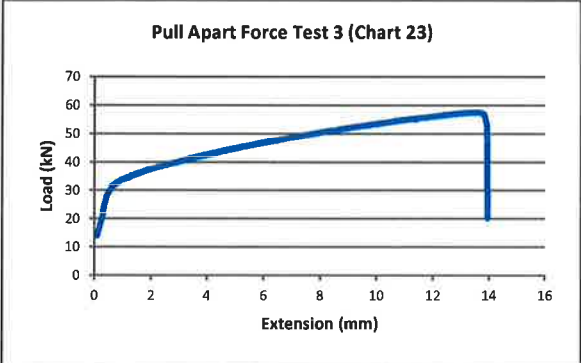
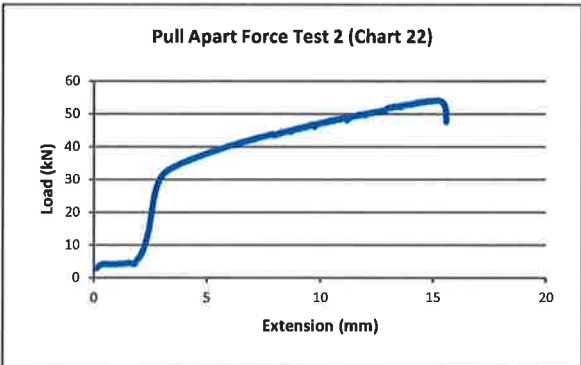
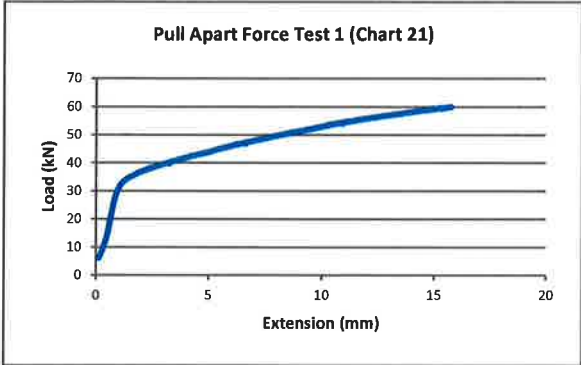


Appendix B

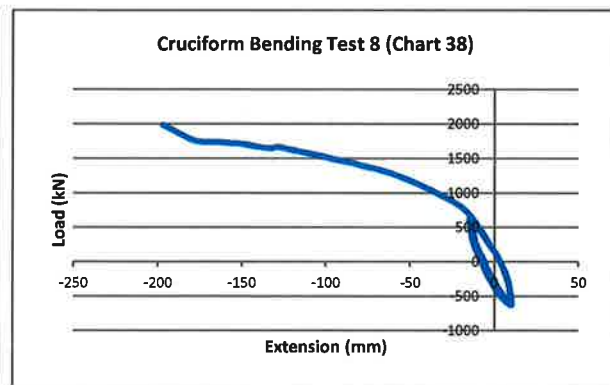
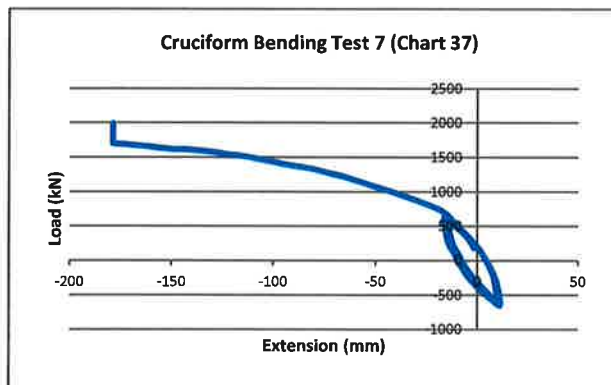
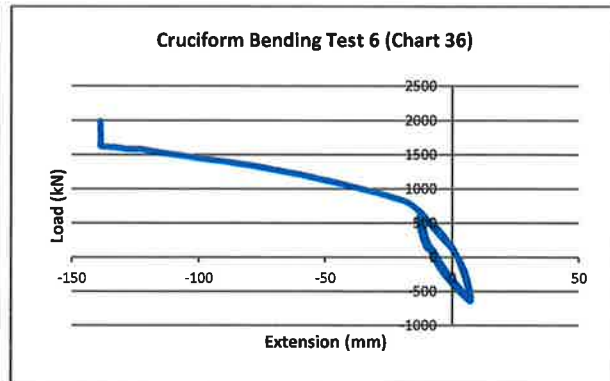
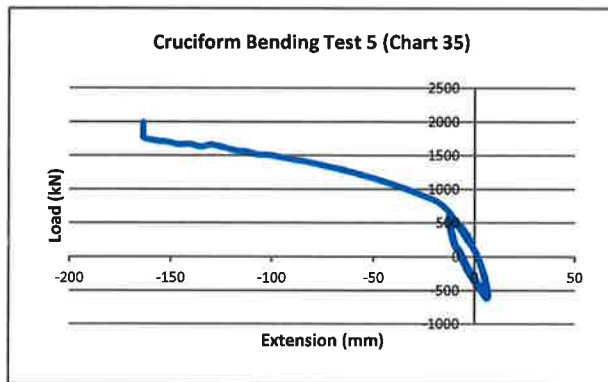
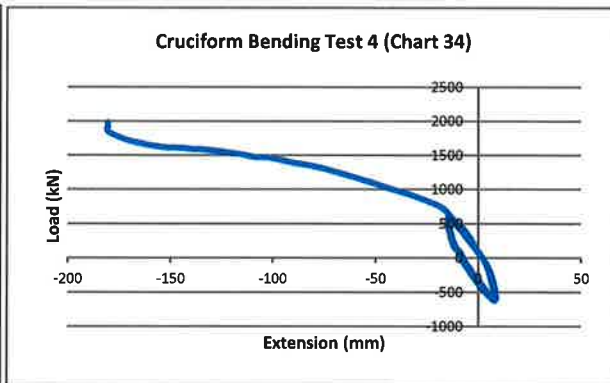
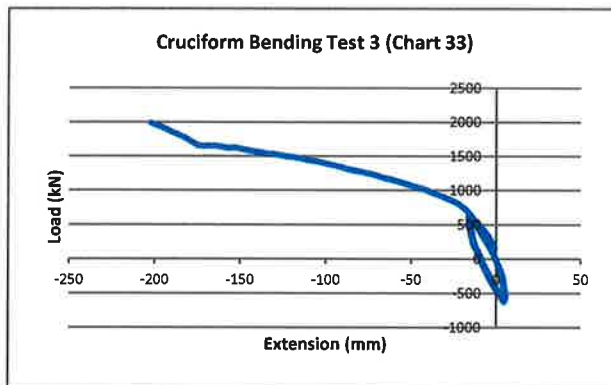
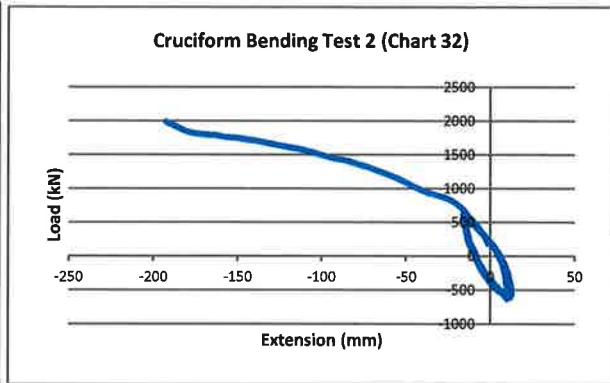
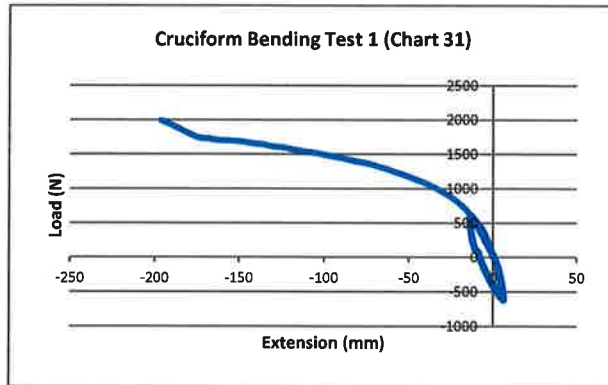


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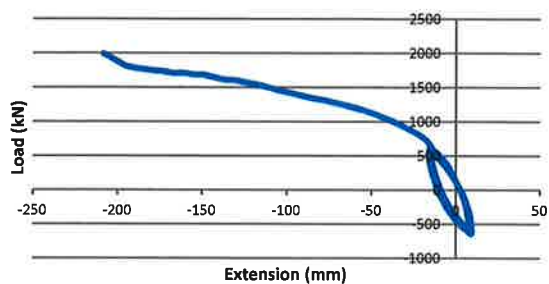
Appendix C



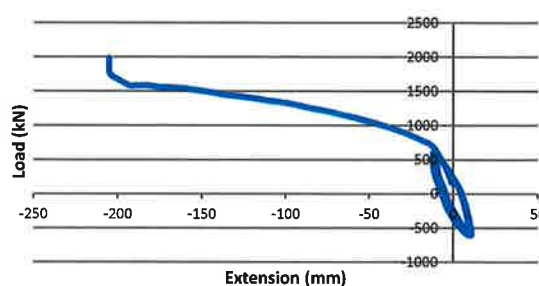

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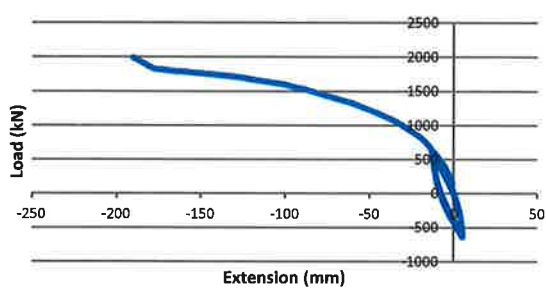
Cruciform Bending Test 9 (Chart 39)



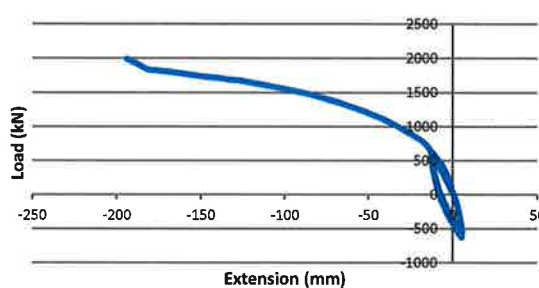
Cruciform Bending Test 10 (Chart 40)



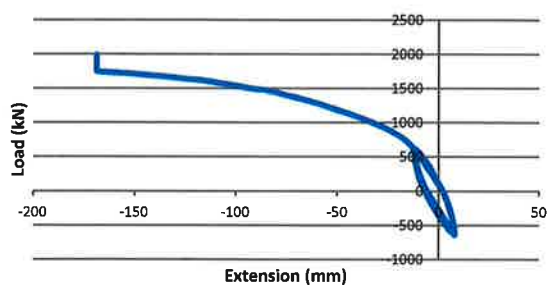
Cruciform Bending Test 11 (Chart 41)



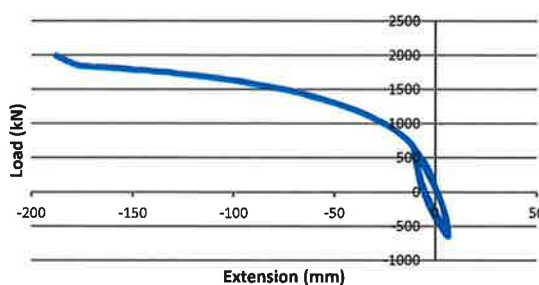
Cruciform Bending Test 12 (Chart 42)



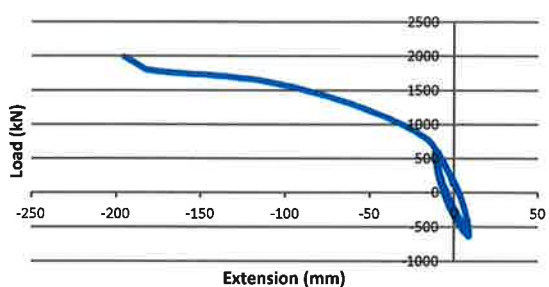
Cruciform Bending Test 13 (Chart 43)



Cruciform Bending Test 14 (Chart 44)



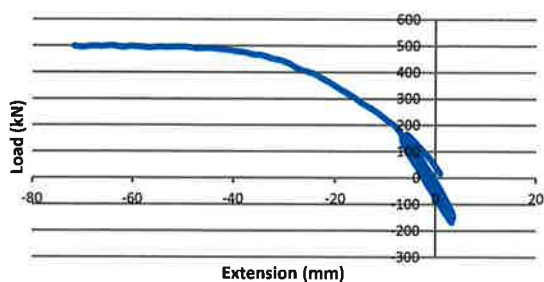
Cruciform Bending Test 15 (Chart 45)



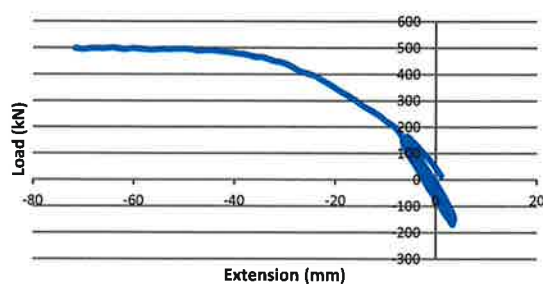
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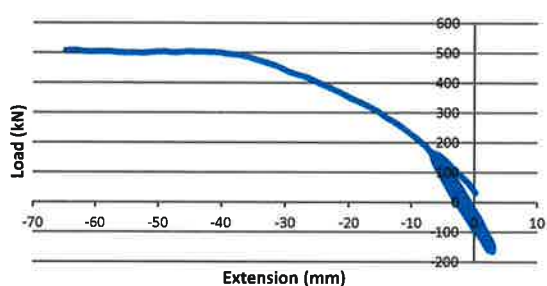
Rotational Moment Test 1 (Chart 46)



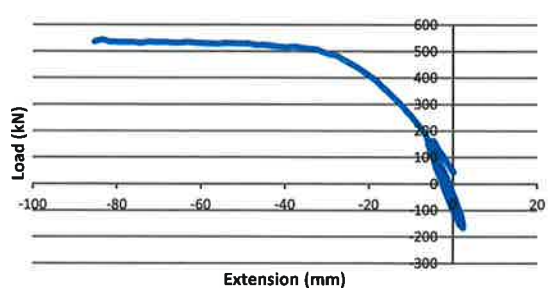
Rotational Moment Test 2 (Chart 47)



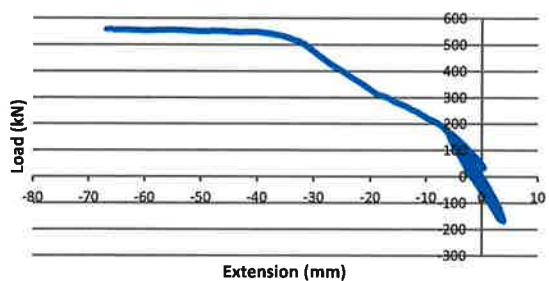
Rotational Moment Test 3 (Chart 48)



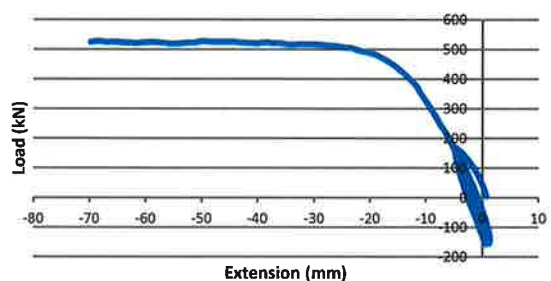
Rotational Moment Test 4 (Chart 49)



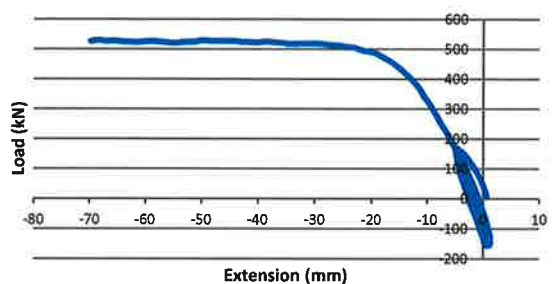
Rotational Moment Test 5 (Chart 50)



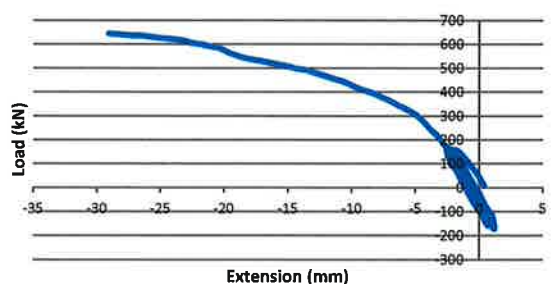
Rotational Moment Test 6 (Chart 51)



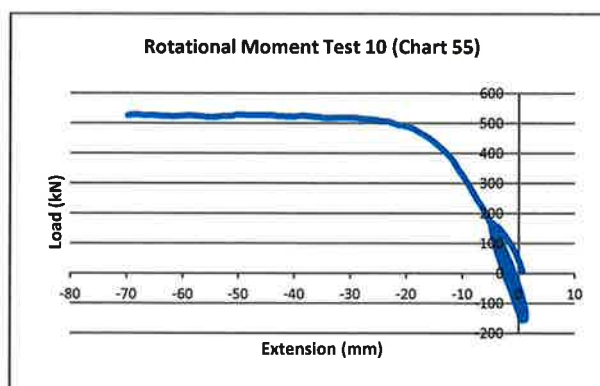
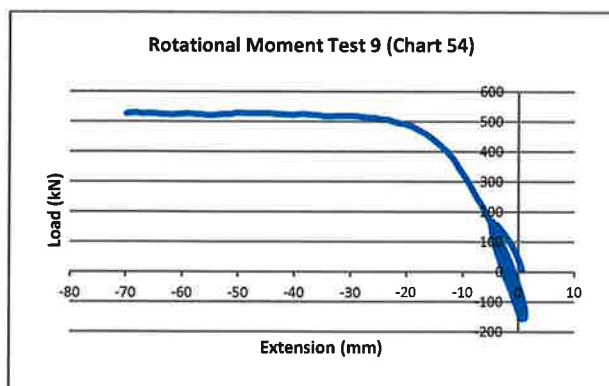
Rotational Moment Test 7 (Chart 52)



Rotational Moment Test 8 (Chart 53)



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A handwritten signature in blue ink, appearing to be "C. M. M.", is located in the bottom right corner of the page.